

In re Patent Application of:
RAINERI ET AL.
Serial No. 10/079,925
Filing Date: **FEBRUARY 20, 2002**

REMARKS

Applicants would like to thank the Examiner for the thorough examination of the present application. Applicants would also like to thank the Examiner for allowing Claims 12-15, 19-23 and 25-26.

Independent Claim 7 has been amended to more clearly define the present invention over the cited prior art references. The informalities in Claims 7, 10, 16 and 24 have been corrected as helpfully noted by the Examiner.

The Examiner's objections to the drawings have also been addressed. In particular, FIG. 5 has been modified to include a line from reference numeral 6 to its corresponding second thickness oxide layer. The openings through the oxide layer 4 in FIGS. 12 and 13 have been labeled as **4A**, as well as the oxide layer 4 itself. The unit of time for the graph illustrated in FIG. 21 has been labeled as "minutes". The claim amendments and arguments supporting patentability of the claims are provided in detail below.

I. Amended Independent Claim 7 Is Patentable

Independent Claim 7 has been rejected over the Eshita patent. However, independent Claim 7 has been amended to include the subject matter from dependent Claim 8. Claim 8 has been rejected over the Eshita patent in view of the Kitabatake patent and in further view of the Wolf article. Amended independent Claim 7 will be discussed in view of this 3-way rejection.

Amended independent Claim 7 is directed to a method for forming isolating structures in a silicon carbide layer. The method comprises forming a masking layer on first and

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second portions of the silicon carbide layer, forming openings through the masking layer to expose the first portions of the silicon carbide layer, and implanting ions into the first portions of the silicon carbide layer.

The silicon carbide layer is heated to form an oxide layer thereon having first portions on the first portions of the silicon carbide layer and having second portions on the second portions of the silicon carbide layer. The first portions of the oxide layer have a first thickness and the second portions of the oxide layer have a second thickness less than the first thickness. The oxide layer is removed to form isolating regions in the first portions of the silicon carbide layer, and insulation material is deposited in the isolating regions to form isolating structures. This advantageously allows the isolating regions to be formed without having to remove any of the silicon carbide layer.

Referring now to the Eshita patent, Eshita discloses forming a masking layer on a silicon carbide layer, forming openings through the masking layer to expose first portions of the silicon carbide layer, and implanting ions into the first portion of the silicon carbide layer. Eshita further discloses on page 4, lines 15-25 that the silicon carbide layer is heated so that an oxide layer is formed having a first thickness on the area protected by the masking layer and a second thickness greater than the first thickness on the first portions of the silicon oxide layer.

As correctly noted by the Examiner, Eshita fails to disclose that the oxide layer is removed to form isolating regions at the first portions, and that insulation material is deposited in the isolating regions to form isolating

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structures. The Examiner cited the Kitabatake patent as disclosing in FIGS. 2C and 2D the removal of the oxide layer (column 7, lines 56-57) from the silicon carbide layer to form isolating regions at the first portions. However, Kitabatake fails to disclose that insulation material is deposited in the isolating regions to form isolating structures. Instead, Kitabatake discloses that another oxide layer is formed on the silicon carbide layer.

The Wolf article discloses that "trench etch and refill" technology is suitable for isolating devices of the same type, and can be considered as replacements for LOCOS isolation. The Examiner has taken the position that it would have been obvious to modify Eshita by removing the oxide layer from the silicon carbide layer based upon Kitabatake, and then depositing insulation material in the isolating regions based upon Wolf.

The Applicants respectfully submit that there is no proper motivation to selectively modify the primary reference in the manner set forth by the Examiner to arrive at the claimed invention as recited in amended independent Claim 7. More specifically, one of ordinary skill in the art would not look to modify the Eshita patent to remove the oxide layer from the silicon carbide layer, and then deposit insulating material to form isolating structures without having had the benefit of studying the Applicants' specification.

In fact, Eshita teaches away from this approach. Reference is directed to FIG. 5E and to page 5, lines 31-33 of Eshita, which provides:

"In this process, too, the selective
oxidation of SiC facilitates the formation

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of the device isolation structure. Thus,
the bipolar transistor can be formed by a
simple procedure without providing the
mesa structure." (Emphasis added.)

In other words, a skilled artisan would not look to modify Eshita by removing the oxide layer which can be used to provide an isolation structure for the bipolar transistor as quoted above, without having had the benefit of studying the Applicants' specification. The Examiner appears to be using improper hindsight reconstruction based upon the teachings of the Applicants' specification to assemble the disjoint pieces of the prior art. It is therefore submitted that there is simply no proper teaching or suggestion in the prior art to modify the Eshita patent to remove the oxide layer therefrom as disclosed in the Kitabatake patent, and then deposit insulation material in the isolating regions to form isolating structures as disclosed in the Wolf article.


The Applicants submit that amended independent Claim 7 is patentable over the Eshita patent in view of the Kitabatake patent and in further view of the Wolf article. In view of the patentability of amended independent Claim 7 as discussed above, it is submitted that dependent Claims 9-11, which recite yet further distinguishing features, are also patentable over the prior art. Thus, these dependent claims require no further discussion herein.

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CONCLUSION

In view of the amendments to the claims and the arguments provided herein, it is submitted that all the claims are patentable. Accordingly, a Notice of Allowance is requested in due course. Should any minor informalities need to be addressed, the Examiner is encouraged to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,



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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an envelope addressed to: COMMISSIONER FOR PATENTS, P.O. BOX 1450, ALEXANDRIA, VA 22313-1450, on this 9 day of February, 2004.